MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

DCT5016 – CIRCUIT THEORY

(Diploma in Electronic Engineering)

12 OCTOBER 2019
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **4** printed pages excluding the cover page with **4** questions.
2. Answer **ALL** questions. All necessary working steps must be shown.
3. Please write all your answers in the answer booklet provided.

QUESTION 1 (25 MARKS)

a) Based on **Figure Q1.1**:

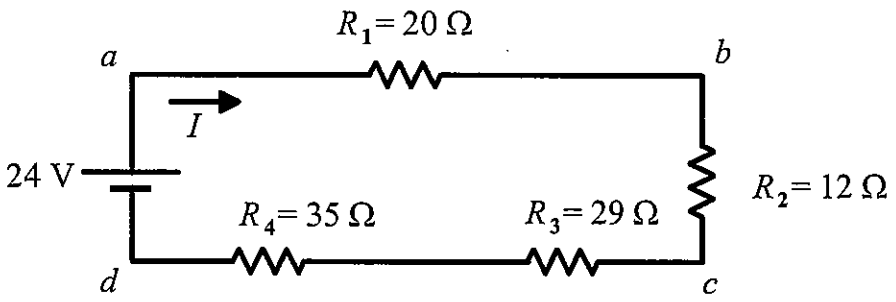

Figure Q1.1

i. Find the total resistance of the circuit.

(2 marks)

ii. Find the total current flowing in the circuit.

(2 marks)

iii. Find the voltage across each of the resistors.

(4 marks)

iv. Verify Kirchhoff's voltage law around the loop.

(3 marks)

v. Use voltage divider to find the voltage between points *c* and *d*, V_{cd}.

(2 marks)

b) Five identical resistors, $R_1 = R_2 = R_3 = R_4 = R_5 = 5\ \Omega$, are connected in a circuit shown in **Figure Q1.2**.

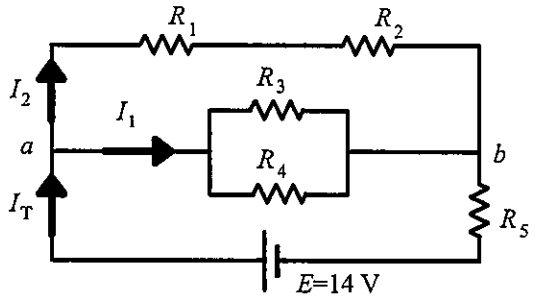

Figure Q1.2

i. Find the total resistance of the circuit.

(6 marks)

ii. Calculate I_T.

(2 marks)

iii. Use current divider to find I_1 and I_2.

(4 marks)

Continued...

QUESTION 2 (25 MARKS)

a) Refer to the circuit shown in **Figure Q2.1**:

i. Write the branch-current equations for the circuit in terms of I_1, I_2 and I_3.

(5 marks)

ii. Solve the equations in part (i) for I_1, I_2 and I_3.

(4 marks)

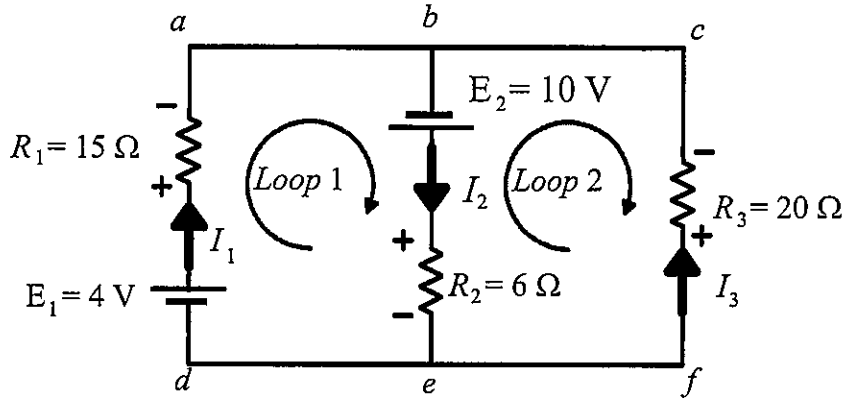

Figure Q2.1

b) Use Thevenin's theorem to calculate the voltage across and current flowing through the load, R_L, in **Figure Q2.2**.

(7 marks)

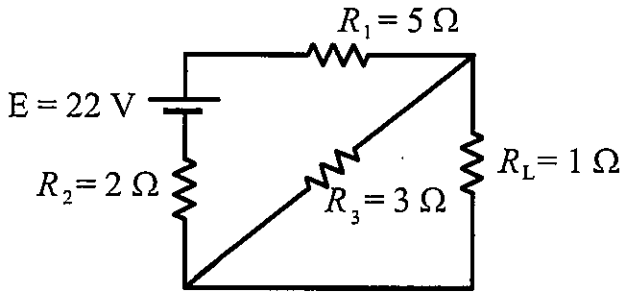

Figure Q2.2

c) Apply nodal analysis to find V_1, I_1 and I_2 in **Figure Q2.3**.

(9 marks)

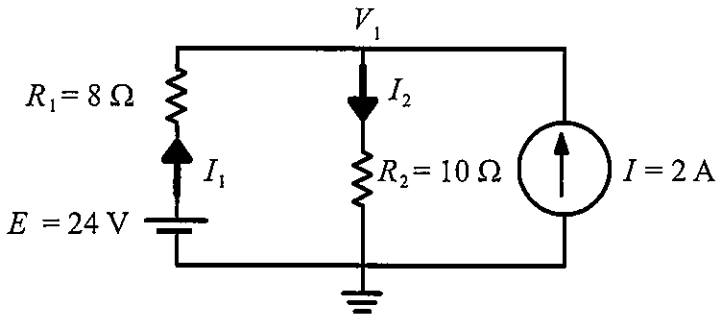

Figure Q2.3

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QUESTION 3 (25 MARKS)

a) Consider the circuit in **Figure Q3.1**. Given that $v_c(t) = 100 \sin (2000\pi t - 50°)$ and $C = 20$ μF:

i. Find $i_c(t)$.

(7 marks)

ii. Draw the voltage and current phasors for the capacitor.

(4 marks)

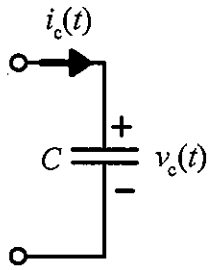

Figure Q3.1

b) Referring to circuit in **Figure Q3.2**.

i. Calculate the total impedance of the circuit.

(10 marks)

ii. Find the current i(t). Express your answer in time domain.

(4 marks)

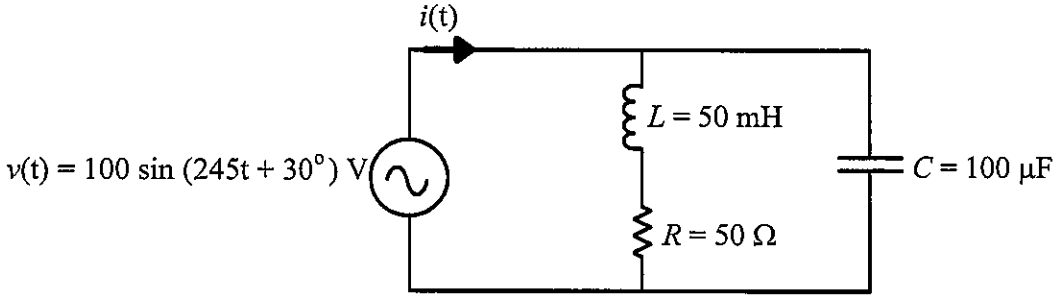

Figure Q3.2

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QUESTION 4 (25 MARKS)

The capacitor in **Figure Q4** is initially uncharged. Switch S is thrown to point p for 20 ms and then to point q, where it remains there.

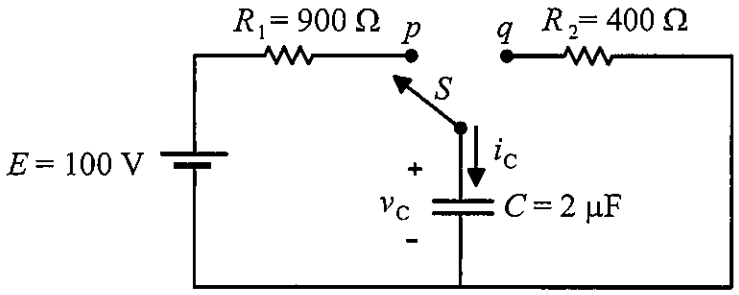

Figure Q4

a) Show that the time constant for the circuit has units of seconds.

(2 marks)

b) Determine the expression for the transient behaviour of the voltage across (v_C) and current (i_C) through the capacitor when switch S is at point p.

(6 marks)

c) Calculate the percentage of voltage across the capacitor with respect to E when $t = 5\ \tau$.

(3 marks)

d) Repeat parts (b) and (c) when switch S is at point q.

(6 + 3 marks)

e) Sketch the graph v_C versus time (t).

(5 marks)

End of Page.